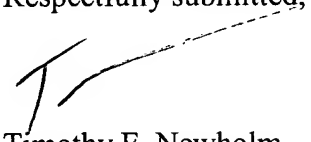
REMARKS

This application has been amended to incorporate the amendments made by Article 34, to insert headings in the specification, to eliminate multiple dependencies in the claims, and to place the claims in conformance with preferred U.S. Patent Office practice without narrowing the claims, and to add an Abstract of the Disclosure. Entry of the amendments and early consideration and allowance are respectfully requested.

Authorization is given to charge any fees in connection with this or any other communication, or credit any overpayment, to Deposit Account No. 50-1170.

Respectfully submitted,



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Although the described arrangements have proven very valuable in compacting soil, sand, or gravel, they can be problematic in the compacting of asphalt or concrete surfaces, because the maximum vertical force prevailing at the reverse point can cause localized indentations that cannot be corrected. Thus, in asphalt rollers the vibration is standardly switched off in reverse operation in order to prevent the roller from sinking too deeply into the asphalt when the direction is changed.

In order to solve this problem, in DE 199 43 391 A1 a vibration exciter is described in which the phase position of the centrifugal weights can be adjusted in such a way that the vertical components of the centrifugal forces produced by the centrifugal weights cancel each other out in each rotational position, while the horizontal components of the centrifugal forces are correspondingly added together in the same direction. This makes it possible for the vibration plate to no longer communicate vertical vibrations to the soil when standing still; rather, via a soil contact plate, shearing stresses are introduced into the soil, with which cracks and pores, for example in an asphalt surface, can advantageously be compacted.

This arrangement has also proved very effective in practice. However, the strong horizontal vibrations that prevail during the standstill operation of the vibration plate are not always pleasant for the operator, and also are not always desired for the compacting of the soil surface.

In DE 1 095 752, an imbalance vibrator for soil compactors is described having two imbalance shafts that stand parallel to one another, each bearing a stationary imbalance mass and an imbalance mass that can be moved in rotational fashion relative thereto. In the standstill position of the vibration exciter, the position of the movable imbalance masses relative to the stationary imbalance masses can be modified and fixed. Once selected, the chosen setting can then no longer be modified during operation.

The present invention is therefore based on the object of developing a vibration exciter of the type named above in such a way that an excessively strong compacting of the soil in standstill operation, due to strong vertical vibrations, can be avoided without exposing the operator or the soil to be compacted to strong countering horizontal vibrations.

According to the present invention, this object is achieved by a vibration exciter having the features of patent claim 1. Advantageous developments are defined in the dependent claims.

A vibration exciter according to the present invention preferably has two imbalance shafts that stand parallel to one another and that can be driven in opposite directions with the same rotational speed, each bearing a stationary imbalance mass and an imbalance mass that can be moved in rotational fashion relative to the stationary imbalance mass and/or to the respective imbalance shaft. Each of the imbalance shafts has an adjustment means with which the relative position of each movable imbalance mass can be adjusted in relation to the imbalance shaft that bears it. According to the present invention, the positions of the movable imbalance masses in relation to the imbalance shafts that bear them.

In this way, it can be achieved in particularly advantageous fashion that the magnitude of the resulting overall centrifugal force, i.e., the vibration strength, can be adjusted dependent on the speed of forward motion of the vibration plate. If the speed is reduced, the effective centrifugal force is also reduced in a corresponding ratio, down to the point at which the machine is standing still, at which point there is no longer any resultant overall centrifugal force, and thus no longer any vibration. In this way, a communication of energy into the soil can be achieved that is very uniform over the surface to be compacted.

In a particular specific embodiment of the present invention, the relative position on each of the imbalance shafts can be adjusted such that the centrifugal forces of the imbalance masses borne by this imbalance shaft cancel each other out in each rotational position of the imbalance shaft. This means that even in operation with only one imbalance shaft a relative position can be achieved in which there is no vibration effect.

In order to achieve a forward motion of the soil compacting device as in known devices, in a preferred specific embodiment of the present invention the relative positions can be modified in such a way that the centrifugal forces of the imbalance masses do not cancel each other out; rather, a resultant overall centrifugal force has a horizontal component. In this way, it is possible to bring about a forward motion of the vibration plate, as is known from the prior art.

Patent claims

1. Vibration exciter for soil compacting devices, having imbalance shafts (2, 3) that stand parallel or coaxial to one another and that can be driven in opposite directions with the same rotational speed, each of the imbalance shafts (2, 3) bearing an imbalance mass (4, 5; 16, 17) attached to it in stationary fashion and an imbalance mass (6, 18) that can be moved in rotational fashion relative to the shaft, and each of the imbalance shafts (2, 3) having allocated to it an adjustment means (9, 19) for adjusting the position of the respective movable imbalance mass (6, 18) relative to the imbalance shaft (2, 3) that bears it, **characterized in that** the relative positions can be adjusted using the adjustment means (9, 19) in such a way that the centrifugal forces produced by the imbalance masses (4, 5; 16, 17; 6, 18) during the rotation of the imbalance shafts (2, 3) cancel each other out as a whole in each rotational position of the imbalance shafts (2, 3).

2. Vibration exciter according to Claim 1, **characterized in that** the relative position on each of the imbalance shafts (2, 3) can be adjusted in such a way that the centrifugal forces of the imbalance masses (4, 5, 6; 16, 17, 18) borne by this imbalance shaft cancel each other out in each rotational position of the imbalance shaft.

3. Vibration exciter according to Claim 1 or 2, **characterized in that** in order to effect a forward motion of the soil compacting device in a horizontal first direction, the relative positions are capable of being modified in such a way that the centrifugal forces of the imbalance masses do not cancel one another; rather, an overall centrifugal force resulting from the centrifugal forces has a horizontal component.

4. Vibration exciter according to Claim 3, **characterized in that** when there is a change between the first direction and an opposite, second direction, the relative positions defined in Claim 1 are capable of being assumed during the transition.

5. Vibration exciter according to one of Claims 1 to 4, **characterized in that** a change of the relative positions can be executed in that the magnitude of an overall centrifugal force resulting from the imbalance masses is proportional to a speed of forward motion of the soil compacting device.

6. Vibration exciter according to Claim 5, **characterized in that** the change of the relative positions can be executed continuously.

7. Vibration exciter according to one of Claims 1 to 6, **characterized in that** the imbalance shafts (2, 3) are coupled with one another positively so as to be capable of rotation in opposite directions.

8. Vibration exciter according to one of Claims 1 to 7, **characterized in that** the phase position of the imbalance shafts (2, 3) to one another cannot be modified.

9. Vibration exciter according to one of Claims 1 to 8, **characterized in that** the adjustment of the relative positions on the imbalance shafts (2, 3) using the adjustment means (9, 19) can be executed synchronously.

10. Vibration exciter according to one of Claims 1 to 9, **characterized in that** the adjustment means (9, 19) can be actuated electrically, hydraulically, pneumatically, or mechanically.

11. Vibration exciter according to one of Claims 1 to 10, **characterized in that** at least one part of the imbalance masses is formed from a plurality of imbalance elements (4, 5; 16, 17).